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The cover: **These giant structures are the tools of modern alchemy. Within their walls crude oil is transmuted into the abundant liquid energy that powers our industrial society. See "City of Silver Towers," page 9.**

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A prominent journalist discusses the current controversy over the huge Interstate Highway Program and issues—

A Call

FOUR years ago Congress enacted into law the greatest public works program in history. Its dimensions were unprecedented: 40,000 miles of road (nearly twice the distance around the Equator); a price tag, to be spread over 16 years, of $27.6 billion.

The arguments presented in favor of the National System of Interstate and Defense Highways: Auto population was increasing at a rapid pace; expanded highway systems were required for an expanding economy; a network of interstate highways was vital to military and civil defense.

About 20 percent of the system is now open to traffic. Work is in progress on more than half of the complex (now pegged at 41,000 miles). At the present construction pace the new superhighway system should be completed by 1975—with a few gaps here and there.

Yet today the program is being attacked and condemned. Charges of waste and confusion fill the air. The situation has become so complex and entangled that even the problem areas become difficult to define.

Key element in the whole matter is fiscal policy—that dull subject we don't like to talk about until it hits our own pocketbook. In this case, it has! And it is this "dull subject" that is paramount in any discussion of what went wrong with the Interstate System and what can be done about it.

But one last general word. There are no pat answers to the woes of the Interstate program. It

Mr. Ingraham, a veteran observer of the highway scene, is the automobile editor of The New York Times.

For Sanity

By Joseph C. Ingraham

is too big and too complicated for pat answers. And it is too important to be dealt with in the highly emotional atmosphere of charge and countercharge now current. The time has come for some sanity and sense of perspective on an issue that affects virtually every citizen in the nation.

WHAT WENT WRONG?

The program's troubles can be measured in terms of time plus costs. The Interstate System was scheduled for completion by 1972; it has been stretched out until 1975. The original cost was set at $27.6 billion; it is now put at $40 billion, and the final bill could go much higher.

The program, as originally conceived, was to be on a "pay-as-you-build" basis, with the users of the highways doing the paying. The Federal Government would provide 90 percent of the funds; the States, the other 10 percent. The Federal Highway Trust Fund was set up to receive and disburse the funds.

The main source of the funds was to be the Federal tax on gasoline, which would bear 80 percent of the burden. The Federal taxes on tires, tubes, and trucks and buses were to be added. New taxes on retread rubber and truck use were enacted to feed the fund. And the Federal gasoline tax was boosted from two to three cents a gallon. This, it was felt, would do the job. Another $1.5 billion paid annually by highway users in special taxes (auto excise, lubricating oil, trucks and buses, and parts and accessories) went into the General Fund.

Two years later, in 1958, it became obvious that this would not do the job. The cost estimate soared *45 percent!* The major reason: a substantial upward revision of construction cost estimates by the States.

There were other fiscal factors. Before the program was even started, it was burdened with a $2 billion bill for previously authorized Federal highways. Traditionally this amount would have been paid out of the General Fund; instead it was made a charge against the Highway Trust Fund, starting the program off in the red.

In 1958 Congress put through special highway apportionments to relieve unemployment. This added another $1.2 billion to the Highway Fund's woes. An amendment to the original law limits road funds each year to receipts in the Highway Trust Fund—even though it has been well established that there will inevitably be deficits in the peak construction years that will be more than offset later.

These matters are serious and important, but they have not drawn the critics' fire as much as some other more dramatic instances of questionable planning.

- **Standards.** As the program stands today, design standards are often applied uniformly in all areas of the country. This means that a stretch of highway that may serve a relative handful of vehicles a day will have many of the same features as one that serves thousands of vehicles daily—including overpasses, controlled-access roads, and interchanges.
- **Defense.** Additions to and changes in the original plan have been made, at considerable expense, to meet requirements of the military. One of the most serious instances of misjudgment,

which may add up to a $1 billion increase in the cost of the Interstate System, is the bridge clearance fiasco.

Vertical clearance of bridges crossing the highways was originally set at 14 feet. Plans were well along and some bridges were actually built when the military agencies announced that higher clearances were required. Although estimates of the clearance requirements ran as high as 18 feet, a "compromise" of 16 feet was established.

The cost of these revisions will be enormous. And it has been estimated that the changes affect only one trip in every 75 million trips by all traffic.

These are some of the problems. They have caused delays, cost increases, and public indignation.

WHAT CAN BE DONE?

Many of the difficulties can be dealt with by increased and improved controls over the program, and much is already being done.

In the area of construction costs, for example, the Bureau of Public Roads set forth in the fall of 1959 a set of contract controls spelling out the amount of money the States could put under contract. This resulted in the letting of fewer construction contracts, increased competition among the roadbuilders, and thereby lower costs. The average cost of building a mile of Federal road rose after the Interstate System started building; it has stayed fairly steady in the last year. Officials are insisting upon sound contracting policies and sound engineering judgments to prevent berserk spending sprees.

Better planning could clear up much of the confusion over military requirements for the system. There is a basic policy at issue here. Some highway economists have noted that a good case can be made for asking the military to pay a part of the Interstate road cost. They advocate tapping military appropriations or the General Fund for a share of a program that was sold to Congress, to an important degree, as necessary for defense—rather than leaving the entire burden on civilian highway users.

Here, as elsewhere in any discussion of the Interstate System and its woes, the road leads directly back to money. How can the program be shaken out of its fiscal doldrums?

In 1959 Congress attempted to do the job by raising the Federal gasoline tax, again by a cent, on a "temporary" basis—thus bringing the Federal total to four cents. Still, the cost of the program continues to mount. And there would appear to be a point of diminishing returns in levying new gasoline taxes. The national average of Federal and State taxes combined is now more than 10 cents a gallon—an average 48 percent of the retail price of regular gasoline.

The Interstate System is financially undernourished. The fiscal cure is a big dose of presently collected highway user taxes now being diverted to other-than-highway purposes. "Diversion," the siphoning off of State and Federal motor vehicle taxes for uses other than highways, must be halted.

As it now stands, an average of $1.7 billion in Federal automotive excise taxes goes into the General Fund annually while the Highway Fund languishes. Some $300 million of automotive tax money on the State level is diverted each year, although 27 States have antidiversion provisions in their constitutions and still others prohibit diverson by statute. The highway user has found himself the object of ever-larger taxation, presumably to finance his roads, while great sums of the money he pays in special automotive taxes are spent for general governmental purposes. Congress has promised to correct this situation, at least in part. On July 1, 1961, when the latest one-cent gasoline tax is slated to expire, a portion of the now-diverted money will finally start going to the Highway Trust Fund on a temporary basis.

What would the now-diverted dollars do for the Interstate Highway System? There is no arguing with the data put forward by those calling for the strictest antidiversion safeguards: these moneys would put the grand plan on the right track.

FUTURE IS UNCERTAIN

At this stage the future of the program is uncertain. It may be that 1961 will be the year of decision, for the Bureau of Public Roads new estimate of costs and its related report on highway cost allocation will be in the hands of Congress early next year.

"Those reports," a Federal spokesman says, "presumably will decide what the future financing of the Interstate program will be, and what highway user tax rates and possibly other revenue sources are necessary to accomplish the financing."

Whatever these decisions may be, they will have to take into account the twin "facts of life" about the Interstate System to date: progress and problems. It can only be hoped that a sense of perspective will attend these deliberations, and that the public officials making the decisions will act with prudence and care. They have a responsibility to see to it that the highway user who pays the bill gets his full dollar's worth of roads.

Dynamite blast marks oil exploration site as rugged men and machines work their way across Kenai Peninsula, Alaska.

THEY MAKE EARTHQUAKES

by James Joseph

ON the still-wild fringes of the world they hack their way through jungles and carve roads across frozen wastelands. Their tools are dynamite and electronic gear. Their assignment: the search for oil.

These are the "seismics," young scientist-frontiersmen who play a little-known but vital role in meeting the world's demands for liquid energy. There are more than 3,000 of them exploring five continents and the shoals of the Seven Seas, under tough and sometimes dangerous conditions.

• Deep in Colombia's Catatumbo jungles seismics pitch tents in floodlighted clearings, braced against attack by South America's wiliest man-killers, the Motilon Indians.

• In the oven-hot Sahara they inch their way ahead, their mine detectors searching sands still sown with deadly relics of World War II.

• In the Canadian North, where the temperature sometimes drops to a lung-searing 50 degrees below zero, they push their search toward the pole.

The seismics derive their name from the seismograph, an instrument that measures and times earth vibrations and that won its spurs detecting earthquakes. The oil prospectors make their own small earthquakes by drilling a hole in the earth and setting off dynamite at the bottom. Shock waves from the explosion race deep underground, where they're reflected from unseen and uncharted rock strata. Then they pound back to

the surface to be picked up by sensitive "jugs" (geophones) and relayed to the seismograph. The result: a jungle of scraggly lines on a chart—a revealing geological profile of the ground below, which can pinpoint those rock formations that might hold oil.

"Might" is the key word. Precise as a seismic portrait may be, it merely suggests the possibility of oil. It gives oilmen a chance to make an educated guess before they sink their drill bits. And drilling failures are expensive enough and frequent enough to cause U. S. companies alone to spend close to $700 million a year for that chance.

A seismic party (anywhere from a handful to three dozen technicians) is a scientific team. Chief scientist is the party's seismologist, usually a graduate geophysicist. From every day's profiles he maps the shape of things underground. His geological assistant is the party's computer. Backing them both is the observer, often an electronics engineer, who tends roughly $60,000 worth of complex equipment.

Surveyor, driller, shooter (he sets off the charge), and geologist, most are of college age. And the team captain, though he may be as young as his teammates, is the "old man." He sets the pace, whether trailblazing the Amazon basin or profiling the West Texas plains.

Along grid trail blazed through Canadian northland, youthful oilmen ram dynamite charge into shot hole.

"Seismics" lay electrical line in Gulf Coast swamp. Geophones fixed to the line will pick up shock waves.

"At 30," laments a veteran party chief, "you're past prime for the field. Time you're 35, you're feeling the cold—down to your marrow. Traipsing swamplands becomes plain torture. So they offer you a desk and air conditioning. If you're smart, you grab them. You're not a half-tough kid any more and you know it."

Seismic surveyors, who move in ahead of the oil hunters, are often a primitive area's first mapmakers (and their maps are appreciatively filed by the government concerned). The area is blocked out in huge squares as though a grid pattern had been imposed by a Titan. The maps show endless miles of grid trails, often the only passable roads in a wilderness. In the Canadian North these primitive roads pay special dividends for trappers: in a single winter local Cree and Slavey Indians took more than 17,000 pelts—lynx, mink, and fox—along 60 miles of trails cut by seismics through northern Alberta.

The men of the seismic crews have learned to live in spots they never heard of in their geography courses. In an oil company office an executive puts it this way: "If you really want to see the world close-up, join the seismics."

He sweeps a hand across a map dotted with seismic jumping-off places: Djebel Zelten, deep in the Libyan desert; Bell River, in Canada's Yukon Territory and but a day's dog-sledding from the shores of the Arctic Ocean; Innamincka, the Australian ghost town that sits forlornly in the Down Under continent's parched Great Basin; Ambato, in Ecuador's rugged mountain country; and Moab, springboard to some of the most parboiled desert in Utah and Arizona.

Crew chief holds seismic profile. Lines indicate geologic underground structure, give clue to possible oil deposit.

Track a grid trail in Canada's sub-Arctic and you discover the adventure and excitement that make seismics keep coming back for more.

Bill Ryan, 20, stakes trail ahead of the bulldozers. A few miles behind him labor the party's two portable drill rigs and their three-man crews. Every quarter mile they sink three shot-holes 45 feet below the muskeg's crust and ready them for 20-year-old Gary Ritchie, the shooter. From the seismic recording truck, its electronic gear insulated against the cold, bearded Barry Hunt, just turned 22, calls the "shots." The blast, when it comes, jars the strata clear to bedrock—to the "basement"—some 5,000 feet underground.

"They're plenty game, those kids," says the party's parka-clad "old man," himself a youthful 29. "Muskeg's froze solid this season, but I can remember times when it's gone soft on us, swallowed a drill rig whole. Ten years ago it plumb went to swamp, overnight. Wasn't a one of our grids that'd support a drill rig, much less a truck."

For six days—while awaiting rescue—they'd lived off the land, shooting scrawny muskeg rabbits to keep the mess pot boiling. Amphibious tractors had then set them on solid ground, but their gear—$200,000 worth of it—was abandoned. Seven months later—after a summer's prospecting knee-deep in Louisiana's bayous—they tracked in over the refrozen muskeg and began where they'd left off.

"Seeing those rigs again was like meeting old friends," the party chief muses.

The camaraderie between men and machines is even closer along the Venezuelan-Colombian frontier, where seismics have turned their pickup trucks into mobile fortresses.

In Colombia's verdant deep-jungle country a youthful shooter runs practiced fingers over the jagged flukes of an ironwood arrow.

"Only thing that armored me was my truck," he says.

He'd driven the pickup to the landing strip, which lay in a clearing two miles from base camp. Returning, he ran head-on into a roadblock. A Motilon war party had rolled a log across the bulldozer-wide road.

"I was just figuring to climb out of that cab and clear trail," he grins wryly, "when wham! a dozen arrows came out from the bush."

Instead of climbing out, he sat tight—"locked

in and sweltering in that cab." His pickup truck was girded with arrow-thwarting steel mesh—standard "armor" in Indian country—so the missiles bounced off harmlessly. "I let them waste their ammunition awhile before I backed out of there, all the way to the airstrip."

It's not often this way, though. As frontier ambassadors in shirt sleeves, the kids have bridged the gap between peoples all over the world.

Bedouins work alongside them as helpers and guides in the Sahara. Brazil's craftiest river pilots ferry the kids across turbulent Amazon tributaries in dugouts. Youthful Turks stake trail for many a party prospecting close to the Soviet frontier.

"Some places," says a world-traveled crew chief, "you can't tell a kid from a native." In North Africa youthful seismics have borrowed the nomads' robes—and even their camels. When a party's home office volunteered a plastic boat, a crew chief in Peru turned down the offer. "Nothing beats a dugout," he cabled with conviction. A South American crew canceled its order for nails when it found that jungle vines worked as well—just as the natives had insisted.

Results of test off the Louisiana coast will help oilmen to determine whether or not they should risk drilling.

On many a foreign frontier oildom's adventurous kids find themselves cast as VIP's. The fact that Americans—and youngsters at that—work up blisters and sweat amazes many a hinterland villager.

A crew's radio is often an area's sole link with the outside. And seismic vehicles, which regularly bring in a village's mail and supplies and tools, have often rushed a sick villager to the nearest mission hospital.

Even when caught up in local revolutions, the kids usually find themselves labeled as "neutrals" and can thus run their grids where many a less unbiased local fears to venture.

Says one seismic who, though now tracking the Sahara, worked the South American jungles during one such battle: "The conservatives were in power and the liberals were in the bush. But the bush folk, though they foraged all around us, never bothered so much as a geophone."

Less accommodating is frontier fauna. Arctic rodents, with a taste for the seismics' recording cables, lay siege to winter grids, sometimes short circuit $15,000 worth of multiconductor cable with a single hungry bite.

In Sumatra the kids hold off pesky insects with nylon netting. Before turning in at night, they make sure boots are hung heels-up and off the ground. Boots carelessly laid to rest are favored nesting places for stinging insects, fist-sized spiders, and the deadliest of Asiatic snakes.

The kids carry a very special message with them into the world's wilderness frontiers.

The Australian aborigine, though he may not savvy a seismic portrait, recognizes the tracked vehicles as the scout cars of modern technology. Unintelligible though the crew's radio may be to Turkish farmers, its message, punching through static, is clear—and resonant with hope for the future. The Amazonian trader who covetously fingers a crew's nylon tent senses somehow the better things that some day may be his.

Perhaps a Sahara nomad spoke for the world's many when he told a party chief: "We wish you well. Your quest is also ours."

For whatever the frontier and wherever oil's prospecting kids, the 20th century lies not far behind.

The sign over Roy Poust's small service station proclaims his selection as gasoline

RETAILER OF THE YEAR

DRIVE down Rubber Avenue toward the center of Naugatuck and you pass Roy Poust's service station—next to Ray's Hardware, across from the old Indian Rock Restaurant.

You are in a Connecticut factory town spread along a river that goes crazy in hurricane time. The streets near Roy's place are narrow and hilly, and there's another station a few hundred yards down the way.

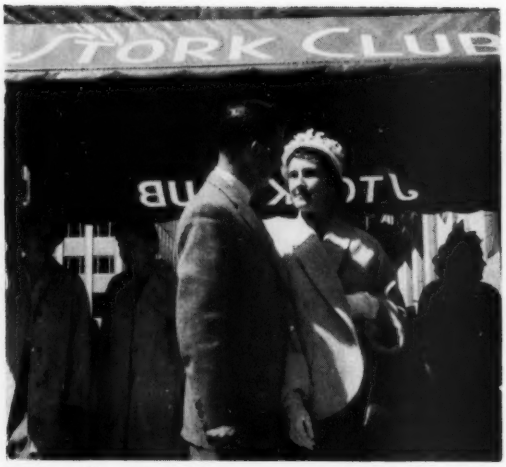
The Poust station has just a single pump island. There are two service bays, no repair shop. The station is 20 years old. Little to distinguish it from any other station—until you notice the sign: "Retailer of the Year."

If you stop and ask questions, you learn that Roy Poust took top national honors in the giant Brand Names Foundation competition this year. You discover that experts selected Poust over hundreds of other entrants as the model gasoline retailer. And having gone this far, you want to know why.

The explanation must start, as Poust insists it start, with his father. Ed Poust became a dealer in 1938. He had $17 left in his pocket after outfitting the station, and he worked 18 hours a day to make good his stake. That included walk-

Naugatuck Little Leaguers meet Ted Williams, courtesy of Roy Poust.

Roy Poust's "service with a smile" brought customers flocking.



Trip to New York City to receive the Retailer of the Year award was a thrill for Poust and his wife.

ing across town to pick up cars for lubrication jobs, in an era when car pickups were unheard of. In 1940 the elder Poust opened a new station, the one his son now operates. Father and son shared the load except during Roy's two hitches in the Army.

The station did well but not spectacularly. Then several years ago Roy decided to try his hand at the Brand Names contest. "It costs money to compete," he says, "and I figured we'd just be throwing it away, almost foolishly. But we wanted to try to win some honor and prestige for Dad."

The money was invested in advertising the brand name products the station carries—the gasoline, motor oil, tires, batteries, and accessories. Special services for customers were inaugurated; special promotions were conducted.

Three times the Pousts were in the finals. Three times they lost out. This year the victory came, but it was too late for Ed Poust. He had died in the fall of 1958.

"My dad didn't live to see us win," Roy says, "but he did see us come mighty close. And I think he was real proud of what we'd done with the station."

The time and money Roy Poust invested in the Brand Names contest brought dividends he'd never expected. Business began picking up almost immediately, as advertising and special sales drew new customers. Poust started sending out thank-you notes following lubrication jobs and then reminder cards when it was time for another job. His lube work jumped 100 percent. He hired two assistants. His wife Betty helped on the accounts. Still, there were barely enough hours in the day to handle the new volume.

People in Naugatuck started to talk to him about community problems. He began taking an active role in the Scouting movement, in the Babe Ruth and Little Leagues. He joined the local Chamber of Commerce and the Rotary, initiated a safe-driving campaign that earned him a special award from Connecticut Governor Abraham A. Ribicoff.

The Poust brand of courtesy is impressive. Any motorist, stranger or customer, can call the station for free road service. All customers are addressed as "Sir" or "Ma'am." When a flood caused a power failure, Poust pumped gasoline with a lawnmower motor, managed to serve every customer who came in.

This spring Roy Poust, his wife, and their two children traveled to the Waldorf-Astoria in New York to accept the Brand Names award. An editor of the Naugatuck *Daily News* went along too, and his column the next day furnished as good an explanation of why Poust is Retailer of the Year as you're likely to find.

"Roy" wrote the editor, "has put his gasoline business, and Naugatuck, in the limelight of national publicity and recognition . . . How? . . . By being a good citizen and a good businessman . . . And by letting the public know he's there to serve them."

CITY OF Silver Towers

THE men in hardhats are amused but patient. They have seen a steady stream of visitors during the past three years. Visitors like this photographer, who keeps chattering about the city even while he is snapping the picture.

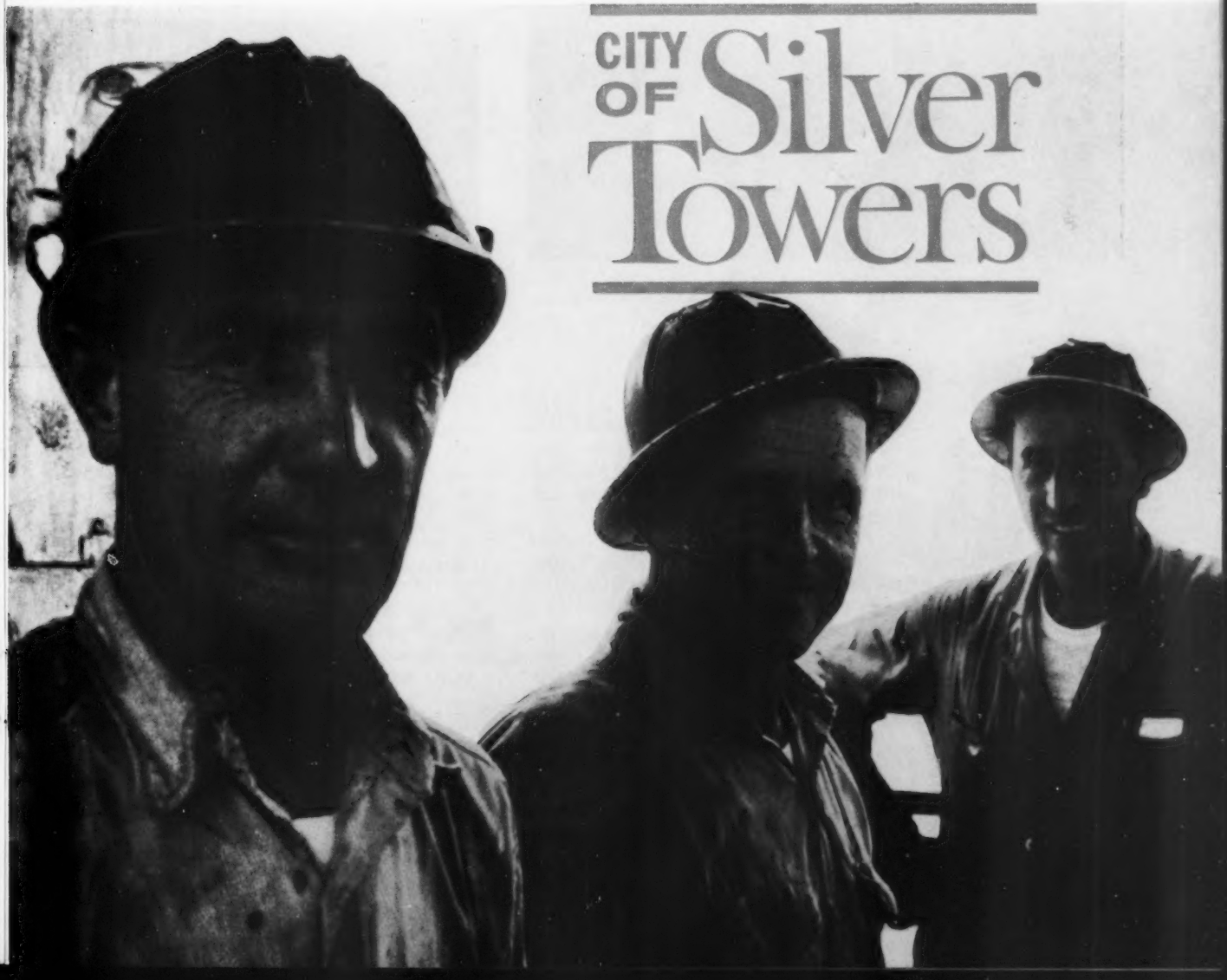
The men in hardhats are oldtimers now, but they can remember their own first months among the soaring towers. And they cannot help but wonder what the visitor would say should he ever really comprehend the complex wizardry of their silver city.

Seen at dusk, or in the hours before dawn, the refinery is a string of glowing lights along the Delaware River. It is only from a distance that it can be taken in: The marine terminal for ocean-going supertankers . . . the tank "farm" of huge cylindrical shapes that store the incoming crude oil and the outgoing gasoline and other petroleum products . . . the powerplant with its 500-foot-high stack. Once within the 5,000-acre area, the visitor is lost in a forest of spires, in a maze of pipe 250 miles in length.

Five years ago this was an empty marshland. Today it is a $200 million complex of electronically controlled equipment. A giant factory that transforms a raw mineral into convenient, economic liquid energy.

Heat and pressure, working over millions of years, created the crude oil. Heat and pressure, applied with the exacting skills of modern technology, create the gasoline.

The heart of the city is the process area. Here is the refinery's "Main Street," 15 football fields in length. In these towers larger molecules of crude



When night falls, the process area becomes a glittering, light-spangled wonderland. For the modern refinery never sleeps.

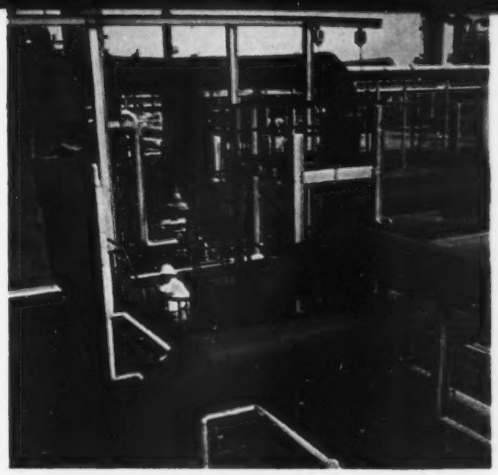
Soaring pipes converge to form giant wishbone above workman who stands atop solvent regenerator unit.

petroleum are rearranged, "cracked" into the smaller molecules used in motor fuel. These are in turn subjected to a gamut of special processes that remove impurities, further refine and improve the product.

During any given day 140,000 barrels of crude oil go in one end of Main Street; enough gasoline for up to 41 million miles of motoring comes out the other.

The flow continues all day, every day. It is part of a vast interdependent network: Oil wells in the Southwest and overseas must maintain their production of crude . . . tankers must stay on schedule . . . pipelines must be full and under pressure at all times . . . tank trucks must be moving at all hours to carry the finished product to a fuel-hungry nation. Should the process hit a snag—anywhere along the line—the supply of products would be endangered, efficiency diminished, the cost of the operation increased.

The flow of oil through the Delaware refinery is maintained by 500 men and a unique electronic information and control system. Data are gathered automatically and continuously from 4,700 points throughout the city. Technicians in nine control rooms receive and interpret the information, make necessary adjustments in the flow by pressing buttons. Within minutes of his request, the refinery manager can



A refineryman pauses to look out over the labyrinth of giant pipe at the sulfur recovery unit.

Technicians in control rooms maintain constant watch over complex operations of silver city.

Within the towering distillation columns along "Main Street" crude petroleum is transformed into liquid energy.

have a plant-wide summary of operations during the previous 24 hours.

Thus the flow of oil is maintained, electronically, within steel tower walls and pipelines. And the visitor along Main Street sees only the varicolored dials in a control room and the huge silver shapes of the crackers.

His camera can encompass the shell of the refinery—the size and shape and color. He can put on film the drama of men in hardhats, Lilliputians among the giant towers who, Lilliputian-like, control them.

But for all his skill, the real wonder of the silver city evades him—just as the men in hardhats knew it would.

Opportunity Rode

IN the gray of a September morning I went to the town garage to begin my career as a schoolbus driver. A dozen buses were lined up, waiting, the yellow paint vivid in the early light.

I had arrived in Goose Creek, along the Texas Gulf Coast, only the day before. The principal had given me instruction sheets and a sketchy map of the route I was to follow picking up and delivering children to the consolidated school.

"We just took these schools into the district," he told me, with his finger on the map. "It'll be tough on some of the children. They may run like quail when they see you."

That was in 1936. The schoolbus that I drove was part of a revolution that had been going on in education since gasoline and the internal combustion engine had made automotive transportation both feasible and economical. Fleets of buses, the color standardized as National School Bus Chrome, reached out farther and farther as fast as all-weather roads were built.

My route took me away from the oilfields and refinery near town and out through woods and small farms, in country cut through by creeks and bayous. I can still see the faces of the boys and girls waiting by the road, worried because they were leaving their old schools (now closed and locked), wondering what school in town would be like, a little frightened at going so far from home on a bus. Few of them seemed aware that new horizons were being opened to them, horizons their parents never dreamed of.

One boy I remember in particular. He had lived all his life "back by the bayou," where the women dipped snuff and went barefoot. He was shy and suspicious. He sat on the seat across from me with his lunch in a tin bucket between his knees. When I stopped to wait for other children to board, he held his hand between the sun and the skyline, telling time as they did in the fields.

"I reckon we gonna be late," he said with a worried look on his face. "Ain't you a-scared they'll take up books afore we git thar?"

I dropped him off in plenty of time, at a grade school where children were playing on the slides and seesaws and other modern playground equipment. I took the others on to junior and senior high schools.

When they planned their programs of study, the children found that they had a wide choice of subjects (including wood and metal shop, homemaking, and typing) in a curriculum designed to make them better citizens and to equip them with skills for making a better living. Because it was

Dr. William A. Owens, an educator for more than 30 years, is associate professor of English at Columbia University and director of the university's summer session.

e a Yellow Bus

by William A. Owens

centered in a prosperous oil area, the community also could afford to offer good music and athletic programs in its schools.

On the trip home I could see a difference in the children. As bus driver and teacher, I had been in continuous contact with some of them all day. They had already begun to adjust to new ways, new attitudes, and a routine of living centered around the schoolbus.

During that year I saw boys and girls who had been "country" in looks and manners and speech take on some of the polish of their town classmates. Some of them still lived "back by the bayou," but they looked like children living anywhere else in the district. More important, boys and girls who previously could look forward only to the drudgery of the farm were veering toward more rewarding work made possible by the skills they were acquiring in the consolidated school.

Driving a schoolbus gave me an unusual opportunity to observe the change taking place. Americans had accepted the idea that all children are entitled to a free public education and that where the child lived should not prevent his getting it. In line with this thinking, schools were located so that the children could walk to them. This meant thousands of one-room schools, the little red schoolhouses that became the symbol of American free education. Now, as I watched little schools disappear, I could understand how tremendous the change was and could evaluate it in terms of my own experience.

I STARTED to school in 1912 in an isolated backwoods community where the people existed by raising cotton and corn on land too poor to sprout peas. Farming meant one man, one mule, one plow crawling slowly over a little patch of ground. My school was a Texas version of the little red schoolhouse, with one room and one teacher—a jolly woman who had acquired her teaching certificate by taking seventh-grade examinations at the

county seat. There were no grades. The pupils studied whatever books they had at home. I learned to read in a United States history because that was the book I had. Lessons in reading, spelling, and counting were interrupted by trips to the water bucket in the corner or the bushes out back.

During my early years in school the State made attendance mandatory and required that schools be graded and that teachers improve their certification. It also began to furnish free, standardized textbooks. These measures brought about a remarkable change, but my community was still isolated. No one owned an automobile of any sort. Boys and girls who lived too far to walk came to school in buggies or on horseback. We had no communication, not even spelling bees, with the schools in districts on either side of us. We struggled with Latin and algebra, over the protests of a community that could see no reason for either. Sometimes at recess we danced to the words of *Old Joe Clark* or sang *Barbara Allen.*

In 1928 I went back to teach in that same school, which at the time had eight grades and two teachers. The community was not quite so isolated. There were a few cars but not a single radio. During rainy spells our only contact with the outside world was through the mail carrier, who came on horseback.

Once a year the University Interscholastic League of Texas held meets designed to bring selected children from the ten thousand or so separate schools in the State together for athletic and literary competitions. Once a year teachers in the little rural schools drilled a few students in spelling, the only subject in which they could hope to win a place in the county meets. Once a year, with great effort, these children were brought to the county seat to spell each other down and visit with each other. Perhaps some wise educator planned the meets with the idea that not the spelling but the communication was what mattered.

CONSOLIDATION, which began about 1920 and rapidly swept the country, reached my county after I had gone elsewhere to teach. My school became part of the district centered in the county seat 20 miles away. The old frame building was torn down, and the children were sent by bus to a school with better buildings, better qualified teachers, and a curriculum extensive in both cultural and vocational subjects.

In 1953 I visited this community where I had started my career both as pupil and as teacher. The change was remarkable. The mail carrier comes in his car over a new asphalt road. Wornout farms have been transformed into grazing lands for good cattle. One man with a tractor farms the patches formerly farmed by a dozen men, their wives and children, and their one-horse plows. Most of the shacks have disappeared because the tenant farmers who lived in them have gone to better jobs elsewhere. The houses that remain are larger, better equipped. The people who live in them have television, radio, and books, and more leisure to enjoy them. Their children are only a bus ride away from excellent schools and from the Interscholastic League meets, music festivals, and other extracurricular activities now accepted as a part of American education.

I asked about the boys and girls I had taught. Most of those who had been tenants on the land had left to become a part of the pool of unskilled labor. They were not trained for anything better. Born too soon, too far out in the country, they missed what is taken for granted by their children.

IT is a truism that consolidation has been a great aid to the ideal of free public education for every child. Nevertheless, statistics reveal startlingly how great the change has been. Between 1918 and 1936 approximately 70,000 small schools disappeared through consolidation with larger districts. From 1947 to 1956 local school districts were reduced in number from about 104,000 to 50,000.

Statistics on school transportation are equally surprising. In 1919-20 only 1.6 percent of the public school children were transported at public expense. By 1957-58 the number had grown to more than 11.3 million, or 33 percent of the total. It is estimated that in 1960 approximately 12 million children will be transported to the public schools, mostly by the familiar yellow schoolbuses.

The advantages of consolidation are impressive. Larger school districts have a better tax base and can operate more economically and effectively. They can afford better buildings and equipment, better qualified teachers, and curricula that will better prepare boys and girls for living and making a living. Costs of transportation are offset by other economies made possible by larger student bodies.

During the 19th century the little red schoolhouse was the symbol of education in rural America. In the 20th it has been replaced by the yellow schoolbus.

At the age of 30, C. W. Trainer decided to go it alone as an oil producer. He soon discovered that the oil patch is—

no PLACE FOR A SLOW-POKE

by Downs Matthews

NOVEMBER 10, 1956, dawned clear and cold. On the flat, tawny prairie 12 miles west of Lovington, New Mexico, a battered blue and white Ford lurched to a stop in a cloud of *caliche* dust that the morning breeze quickly whipped away. A husky young man named C. W. Trainer got out of the car, walked to a valve-capped pipe sticking out of the chalky earth, and stood regarding it silently for a moment.

The pipe marked an oil well drilled years before by a large company and long since abandoned as a failure, a dry hole. C. W. had invested all but $300 of his reserve of capital to reopen the well on the chance that the company's geological experts had been wrong.

He had spent the entire previous day running his own tests in the effort to bring the well in, to make it produce oil. Instead, the well had produced nothing but air. All day long it had blown air like a factory whistle. It was dry.

So this morning he had the unhappy task of spending the last of his money plugging the well for good, so that it could be safely abandoned. He stood silently a moment, and then on an impulse he twisted open a valve to see if the wind was still howling up. A stream of crude oil gurgled out onto the ground. The well had come in during the night.

At the age of 30, C. W. Trainer had become an oil producer, the owner of a full-fledged producing well, the discoverer of an oilfield. Twelve years of training and experience in one of the most demanding and complex and fascinating businesses in the world had led him to a stretch of deserted prairie in New Mexico and what he calls "the biggest thrill of my life."

HIS father was working as a cowboy in West Texas when C. W., Junior, was born in 1926. With a son to educate, his parents decided to move to town. They settled in the village of Mertzon (pop. 768) and Mr. Trainer, Senior, became the owner and operator of a service station. Later he started the feed business that he operates there today.

C. W. grew up in Mertzon. He was quick, ambitious, and big for his age. He was graduated from Mertzon High School and entered Arlington State College when he

C. W. Trainer stands beside pipe that marks site of abandoned oil well.

was just 16. After two years, he transferred to the University of Texas.

In 1945 C. W. served a brief Air Corps stint, returning to civilian life and college with the end of World War II. His father was able to pay for half the cost of his education; to earn the rest, C. W. had to drop out of school six times to work in the oilfields. Thus it was not until 1948 that he received his degree in electrical engineering. His first job after graduation was as an engineer-trainee with the Schlumberger Well Surveying Corporation.

The company sent him to Midland, Texas, to learn the science of electrical logging. He was taught how to use complex instruments that are lowered into prospective oil wells to measure various physical properties of geological formations. The information gathered is recorded on long charts, the "logs" that were to be so important in his future. He learned to read and interpret them, an art blending electronics, physics, mathematics, and intuition. The information on the charts provided clues to the possible presence of oil or gas.

After duty as a field engineer, C. W. was transferred to Russell, Kansas. But in leaving Midland, he took with him as his bride the boss' beautiful secretary, Jacquelee Pounds.

C. W. started moving up the corporate ladder. In 1951, at the age of 25, he was named manager of an office in Hobbs, New Mexico. For four years he studied the geology of the region. In July 1955 he was given an executive post in the company's area headquarters in Fort Worth.

"At this point," C. W. says, "I began to wonder if I really wanted what I was headed for: moving up in a big company. It seemed like running my own business would be more fun. Besides, Jackie and I were born and raised in small towns and we don't have much use for cities. The idea of raising our children in big places like Fort Worth or Houston didn't appeal to us."

The following summer C. W. heard about a refrigeration business for sale in Hobbs. He and Jackie had enjoyed living there and he had saved up $10,000 to buy "some sort of business." He made the trip to Hobbs and met two friends who were independent oil operators. They suggested he forget refrigerators and get into a business he knew something about: oil. And they offered to help him get started. C. W. liked the idea. So did Jackie. Within a month they had moved back to Hobbs, and C. W. was in the oil business for good—on his own.

He wasted no time. In partnership with a friend, he set about making arrangements to drill his first well. And at the same time he tried his hand at "scavenging" dry holes (opening abandoned wells like the one at Lovington).

C. W.'s partner had located a tract of sandy farmland in Terry County, Texas, on which three wells had been drilled. Two of the wells had been dry; the third had produced a little oil before going dry. After three failures, the company that had leased the mineral rights allowed its leases to expire. After studying electrical logs and other drilling data, C. W. concluded that the area was worth another try. He began leasing his first mineral rights.

Twenty people owned leases or unleased mineral rights in this tract. C. W. traded with all of them until he and his associate owned all the leases, an amazingly complex operation.

One typical trade involved a farmer who owned one-fourth of the mineral rights under 160 acres. C. W. agreed to pay him $800 for a one-year lease. Then to raise the cash he needed to make this payment, C. W. sold 1/64 of the "production" of the yet undrilled well.

When the partners had put together a block of 800 acres, they felt they had sufficient acreage to protect their position should their well prove successful. They found a Midland operator who agreed to drill the well. He in turn raised some of the cash he needed to drill by selling 40 percent of his interest in the leases to a group of New Orleans investors. At this point, C. W. and his partner were left with a 1/16 interest in whatever oil might be found as "pay" for their work in getting the package together.

The financing completed, the risk "spread," a drilling rig was moved in. At a depth of 12,600–12,707 feet, the well flowed oil.

C. W. and Jackie were delighted. But three days later their joy turned to gloom when the flow of oil stopped and salt water began to pour from the well instead. About 2,000 barrels of oil were recovered

Independent producer must spend long hours poring over oilfield maps.

before the well went "dry" and was abandoned.

As payment for several months of work and for his ingenuity in getting the deal together, C. W. received about $300 from the small amount of oil recovered.

Meanwhile, though, he had been pursuing his career as a scavenger with varying results. He had been poring over the logs of abandoned wells, searching for the needle in the haystack—the clue that a well owner had guessed wrong and had bypassed a potentially productive underground oil zone.

He spotted his first "needle" in the electrical logs of a hole drilled 10 miles southwest of Monument, New Mexico, which had been abandoned as dry.

C. W. and drilling contractor talk over pending "scavenging" operation.

"I was so green," he remembers, "I didn't check anything but the logs. I should have examined everything—the time it took the drill to pass through the formation, the rock samples cut from the formation during drilling, whatever I could lay my hands on. Every scrap of information is important."

He borrowed $5,000 from a bank and went into equal partnership with another operator. They reopened the plugged well and hired a service company to perforate (shoot holes in) the steel casing opposite the zone of rock they hoped contained oil.

Nothing came out. So they called in another company to "fracture" the rock by pumping fluid into it under high pressure. This opened up channels through which oil might flow.

But all efforts failed. The original owner had been right: the well was dry.

Another of C. W.'s scavenged wells was to make it all worthwhile, though. Following a typically complex series of trades, C. W. found oil where the experts said there was none, in the dry hole west of Lovington—the dry hole which became the discovery well of the Hume oilfield.

He had studied the log of the well, the record of the various rock formations through which the drill bit had bored. He had spotted a section of rock 20 feet thick, almost 4,000 feet below the surface, which the company had not tested for oil during drilling. And he had decided to risk all on reopening the well, in the hope that this thin section of rock might bear oil.

C. W. had figured that the cost of scavenging the Lovington well would be less than $5,000. To raise the money, he made a split-profit trade: his partner would pay all costs of testing the well up to $5,000 in case the hole was dry. But if it should produce oil, the partner would recover his expenses out of the oil sold—and then he would get half the income of the lease.

This clinched, C. W. hired a crew to unplug the well—and ran smack into trouble.

Conservation practices in New Mexico call for a well to be plugged with a length of four-inch pipe cemented into the top of the hole and sticking up four feet as a marker. The company that had drilled the well had done an uncommonly good job of plugging. It had cemented a crooked 30-foot joint of drill pipe into the hole, and C. W. couldn't budge it.

He and his helpers blasted away with jackhammers. They poured acid into holes they chipped into the cement. After 48 hours of sweaty, frustrating labor, C. W. succeeded in yanking the marker and opening the hole.

The unforeseen delay had cost him half his reserve of funds, but at last the well was ready for the next step. A service company was called in to perforate the casing. That completed, he ran a string of tubing into the hole and "swabbed" the well, an action similar to working the plunger in a pump. Then the well began to blow high-pressure air.

For six hours C. W. sat and waited while air whistled out of the wellhead. But nothing salable emerged.

Before giving up, he decided to "acidize" the well. He called upon another service company and had 500 gallons of acid pumped into the formation. Its function was to increase the permeability of the producing zone by dissolving some of the limestone near the hole. But when the well was opened again, it continued to blow air.

Night had fallen when C. W. finally closed the valves and went home to bed. At this point, he had spent $4,700.

During the night the well came in. And when he went out to the lease the next morning to determine

what he would need to plug the hole, he discovered his good fortune.

He rushed back into town and told his family the news. They all bundled into the car and journeyed out to see "Daddy's oil well."

"We were excited," C. W. recalls, "but we didn't have any celebration. We remembered that well that pooped out after making oil for three days. We wanted to be sure this one would last."

And last it did, settling down to a steady 20 barrels a day. Later C. W. fractured it and boosted production to 100 barrels a day. At present the well is having no trouble making its 37-barrel-a-day "allowable"—its quota established by the State conservation board.

Finding the Hume field marked the real beginning of C. W.'s new career, though he has yet to realize any real profit from his operations. In fact, his cash reserves fell so low about six months after the discovery that he was preparing to "hire out for wages" in order to obtain grocery money. At the last minute a buyer for some leases he had acquired walked in his office door. The infusion of new money helped him preserve his status as an independent operator until his wells began to bring in some cash.

C. W. and Jackie, Randall Mark, 10, and Terri Jan, 8, live in an unpretentious three-bedroom bungalow financed through FHA. The Trainers belong to the Hobbs Country Club and both C. W. and Jackie are ardent bowlers. They take family vacations in a house trailer, visiting parks where C. W. can fish.

C. W. says that he is not as active as he'd like to be in civic affairs, but he holds memberships in a fistful of oil groups. And he feels he performs a useful and valuable service in his occupation.

A farmer listens as C. W. Trainer proposes to buy mineral rights under his land.

"As a promoter, I try to turn venture capital into income-producing property. The interest I hold in deals is the pay I get for my work. But if the well turns out to be dry, as eight out of nine wildcats do, then I don't get paid."

So far, C. W. has reentered 12 dry holes as operator. Five have produced some oil. But of these, only three will eventually pay for themselves and make a profit. In addition, he has drilled eight new wells to develop production in known fields. Of these, five made good, two were marginal, and one was dry. In 1959 he produced and sold for his own account 13,000 barrels of crude oil. Even so, discounting the modest salary he pays himself, his operations for the year showed a net loss financially. Only the fact that he is a small operator who can get by on a shoestring enables him to stay in business.

"I'm not rich," C. W. says. "And I'm not looking to get rich. Experience has taught me to play it a lot safer with the chances I take. A discovery is so rare that I'm willing to take a much smaller percentage and sell the rest to cover my drilling costs."

Several things have helped C. W. toward success. One of them is versatility.

"If there's a word for what I do, it's 'scramble.' The larger companies have many different specialists, each dealing with a single phase of the entire operation. But I must do everything myself. And since the companies have some mighty smart men, I run into some stiff competition."

Nevertheless, the independent operator has one big advantage: his independence.

"That's where I can get ahead of them," C. W. says. "I don't have to consult with anybody about a decision. I can get a deal on paper while their man is still huddling with the home office over what to do."

And there's always room for brains in any business.

"You've got to come up with some original ideas now and then if you want to stay in business. You have to build your own ground floors for the others to get in on. The man with the ideas is the man who'll make money as an oil operator, or in any other business.

"Sometimes the play is pretty fast in the oil game. It's no place for a slowpoke. Still, there's always the chance of hitting a big one if you're willing to take the risks, and that's a powerful lure that keeps us out there looking.

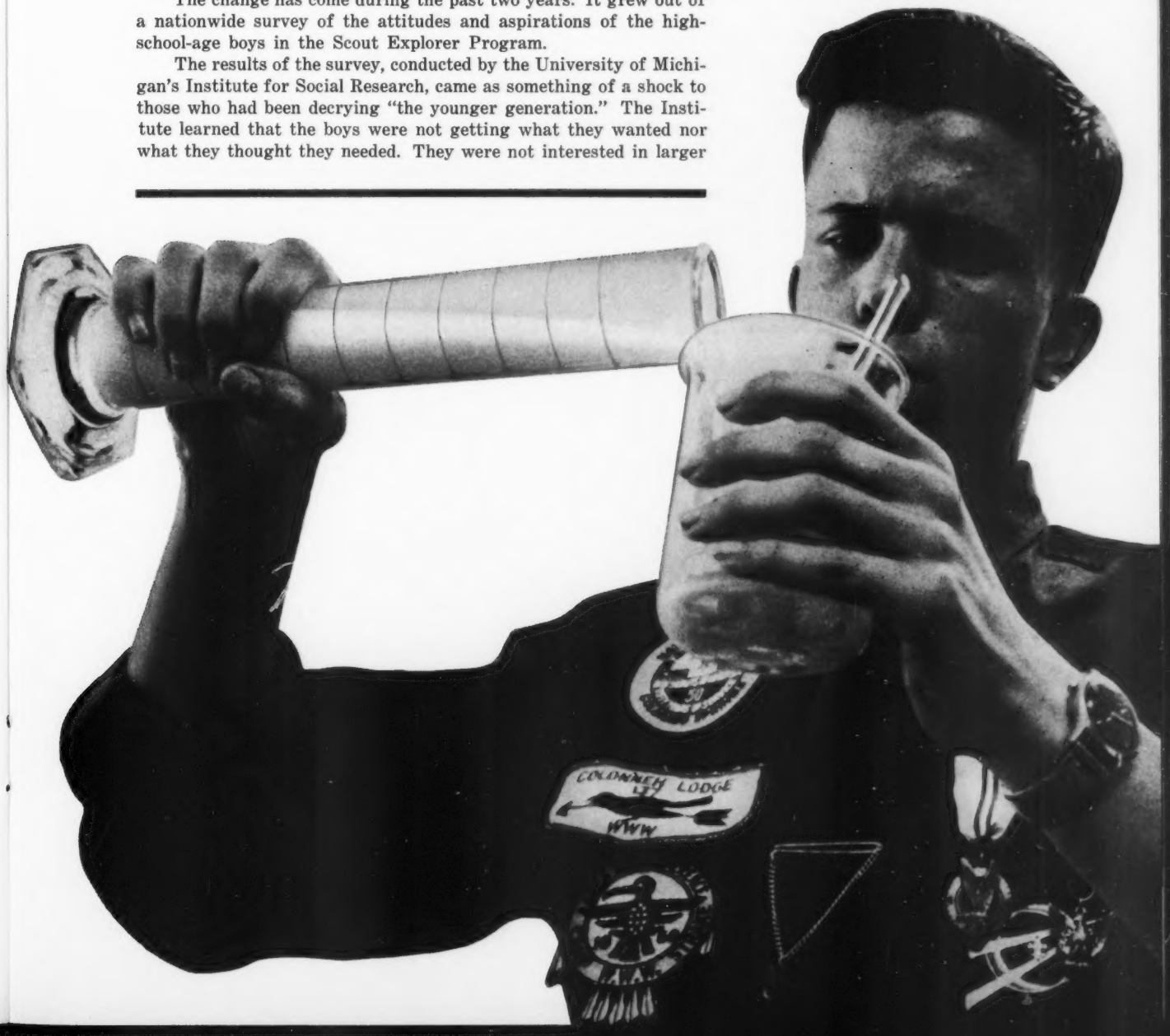
"I may never hit the big one," C. W. says. "The odds say I won't. But just the same, I sure will have had fun trying."

SCOUTING'S NEW LOOK

IF your picture of Boy Scouting is limited to woodland trails and outdoor cookery, it's time you took another look. Modern Scouts have taken a giant step from the bosky dell—right into the middle of the workaday world.

The change has come during the past two years. It grew out of a nationwide survey of the attitudes and aspirations of the high-school-age boys in the Scout Explorer Program.

The results of the survey, conducted by the University of Michigan's Institute for Social Research, came as something of a shock to those who had been decrying "the younger generation." The Institute learned that the boys were not getting what they wanted nor what they thought they needed. They were not interested in larger



Symbol of modern scouting: Oil Explorer makes synthetic rubber in refinery laboratory.

doses of fun and frivolity, but in a more serious and meaningful preparation for adult life. Specifically, they were concerned about the workings of business and industry and about their own career opportunities.

It is a measure of the vitality of the American Scouting movement, which is observing its 50th anniversary this year, that the survey brought immediate and to-the-point action. Specialized Explorer Posts were formed, sponsored by business and professional organizations. And the boys began to get what they wanted.

One of the most unusual of the new groups is Explorer Post 655 in Houston, Texas. Sponsored by a petroleum refining company, it is the first such unit to study one of man's most complicated undertakings, the oil industry.

Members have toured a tanker and a refinery. They have traveled to oil industry historical sites, heard experts lecture, seen special film and slide presentations. They have made synthetic rubber and have learned how to determine the viscosity of oil by running the tests themselves.

One-third of the post's activities is devoted to the petroleum industry; the rest involves such diverse subjects as physical fitness and the social graces.

Henry D. Schmidt, a company employee who serves as advisor, describes the goal as follows: "We strive to come up with a program that is varied enough and challenging enough to appeal to boys above average in intelligence and ambition."

The 28 members of Post 655 meet Schmidt's standards: nearly half of them are in the top 10 percent of their school classes. Their average age is 16 years, and they attend six different schools in the area. Only a third had ever been in Scouting before.

The boys join the post expecting to learn about the oil industry, but Schmidt's concept of "the oil industry" is very broad.

"The knowledge gained in studying the actual 'nuts and bolts' of the industry will be helpful to a boy," he says, "but the fundamental laws or principles underlying this knowledge are more important—fundamental laws of life, science, philosophy, or economics."

Every activity, whether an indoor meeting or a field trip, is aimed at getting beneath the surface. The boys were fascinated at the chance to make synthetic rubber, to build an electric motor, to conduct a gasoline distillation test. But in each case the project and its accompanying lecture gave them a grounding in basic scientific principles.

Advisor Henry D. Schmidt conducts a group of Explorers on a tour of a modern petroleum refinery in Houston, Texas.

Schmidt sees to it that the boys learn from experts and that the experts know how to keep the boys interested. He limits lectures to 15 minutes and encourages the use of films and visual demonstrations. Then he conducts a quiz to see if the boys have understood. "When they stop asking questions," he says, "we know we've gone over their heads." Thus far a total of 41 consultants have lent their talents to enrich the program, many of them for special lectures designed to give the boys an insight into vocations outside the oil industry. Speakers have included a doctor, a lawyer, an accountant, a newspaper reporter, a military officer, a stock broker, a professor, a biologist, a mathematician, and a clergyman.

The range of programs and activities is as varied as Schmidt can make it. There have been field trips to a university campus and to a court in session. One meeting was devoted to the techniques of public speaking; another was entitled "How To Win Friends and Influence People." A most popular session had a group of college girls answering questions on the social aspects of campus life. (The boys were able to put lessons learned at the meeting to work at a coed Christmas party and a progressive dinner.)

Traditional Scouting standards of service and citizenship are not neglected. Members of the post have ushered at football games and have helped out in area Scout meetings. They have studied history, government, and the functioning of the American free enterprise system.

The success of the post can be attributed in large measure to the support of J. D. Seifer, manager of the refinery, and to the backing of the company as a whole. Seifer could not be more pleased with the results to date. And he is quite candid about the fact that sponsorship of the post is a "two-way street."

"There can be few greater rewards for an industry representative," he says, "than to know in his own mind he has a part in the life story of some boy in the community who has demonstrated success as a man." At the same time, Seifer feels that business leaders should start teaching youth the fundamentals of the nation's economic structure and the reasons for industry's very existence.

Seifer does not look upon the program as any kind of oil industry vocational training ground. "It is a very broad activity intended to be of value to a young man regardless of what career he may desire to follow."

He does believe, however, that the members of the post derive lasting benefit from their newfound knowledge of the goals and achievements of American industry.

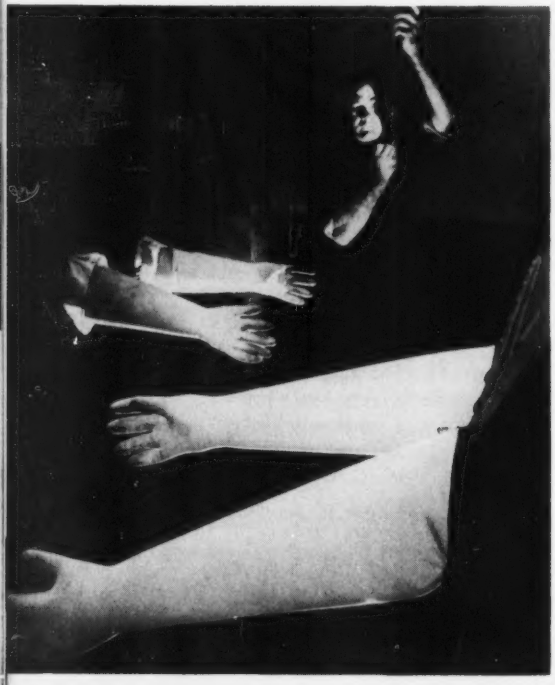
The game is "concentration." The occasion is a coed party, one of several sponsored by Explorer Post 655.

Tanker captain initiates Oil Explorer into mysteries of shipboard navigation tools—here, a gyrocompass.

PETROLEUM POTPOURRI

A kaleidoscopic portrait of the American oilman and his industry

Nightmare scene in oil research lab. Disembodied arms are rubber gloves, used to test materials inside sealed chamber; "mad doctor" is researcher removing sample from flask with long needle.



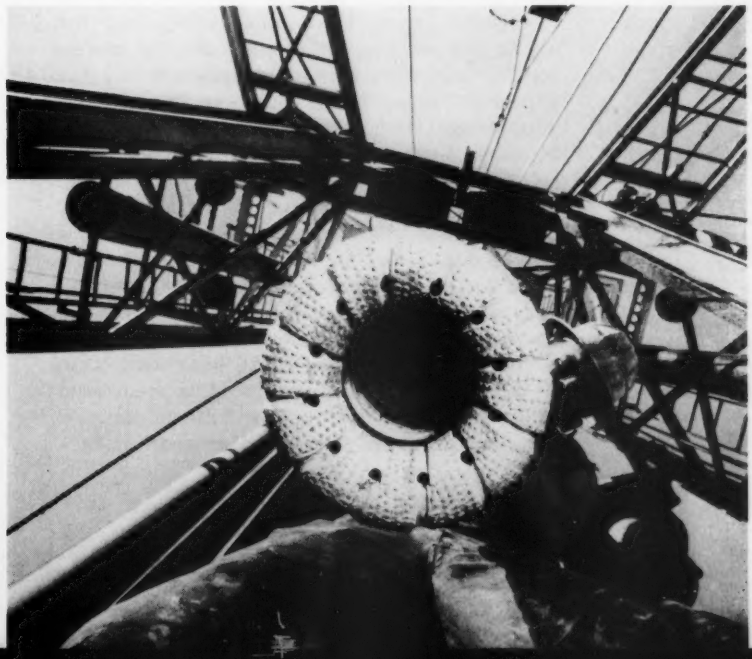
Modern gasoline production requires masses of complex equipment, but refinerymen are not above using kiddie wagon if it does the job most efficiently. Portable unit takes samples of hot liquids safely, easily.

Young men going places are engaged in hotly contested crawling race. Proud parents are employees of petroleum company's synthetic rubber (it's made from oil) division. Occasion is the annual employee picnic.

Sun's rays envelop farmer discing orchard at experimental farm operated by oil firm. Here research men develop new chemicals-from-petroleum to kill bugs, control weeds, and help raise improved crops.

Pair of giant praying mantises pump up crude from separate oil-bearing strata far below—one of thousands of techniques oilmen have developed to ensure maximum recovery of a vital resource.

Diamonds can be an oilman's best friend, but he uses them sparingly—drilling costs are high enough already. This drill bit about to enter well is set with 730 half-carat stones, is priced at approximately $3,000.



I MARRIED A

I AWOKE to the sound of water running in the bathtub. But then, Murph often showers when he comes in from the job in the middle of the night. Pipeliners never heard of the 40-hour week. I turned over and went back to sleep.

The next morning I arose about dawn, hoping I could sneak a bath before the mob started howling for breakfast. I turned on the faucets and plopped into the water, still bleary-eyed with sleep and cursing the rainy New Orleans weather.

It took a few seconds for the fact to register that the thing smiling at me with big shiny teeth from the other end of the tub was a live alligator.

"The boys on the job caught him in the swamps," was Murph's sleepy explanation. "We want to keep him for a mascot."

"Either that thing goes or I do!" I declared. As I remember, Murph took a long, long time making his choice.

But as a pipeline wife, I've learned to expect the unpredictable.

My first impression of pipeliners led me to place them in a social category someplace between gypsies and carnival people. Father, a church deacon, informed me that anyone who moved as frequently as Murph did must be just one jump ahead of the law.

But for five zany years now I've been following my pipeliner. Our two children have been reared in house trailers and seem none the worse for it. In fact, the four-year-old helps her nearsighted mother read the road maps, and the baby can tell at one glance whether a boat is a shrimper or a tug. However, when the "poor, pitiful urchins" are visiting their grandmother's big house, they only seem to feel at home playing in the narrow hall.

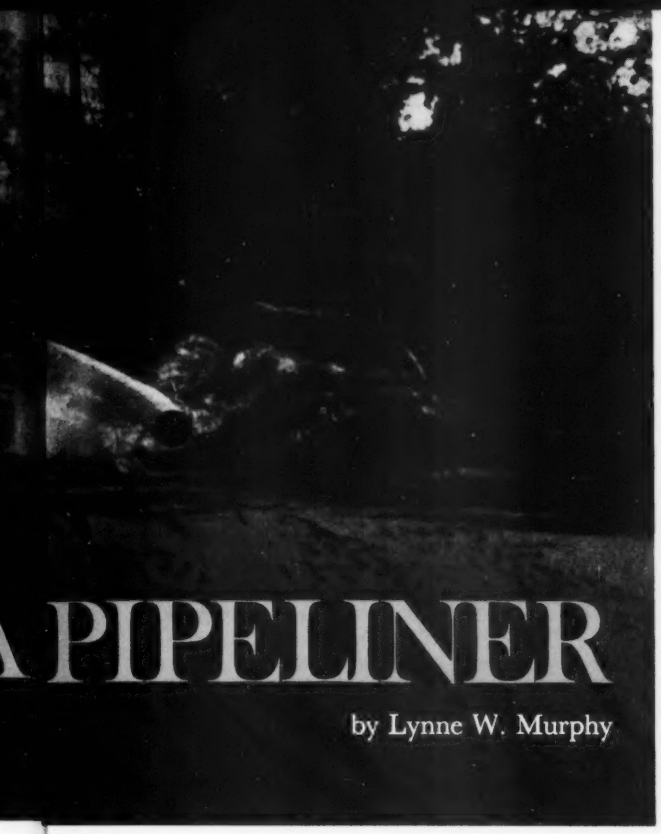
I thought I was an expert on the oil industry. After all, I'm from Oklahoma, where I've seen literally hundreds of oil derricks. But I had a lot to learn.

As I see it, here's the way pipelining works:

This driller over here has some oil, and that refinery up there wants to make gasoline out of it. So some men are sent out to lease a strip of land between the two on which to lay the pipe to carry the oil. During this process there is much talking and slapping on backs.

Now the pipeline company has what it calls the right-of-way. It brings in a million dollars' worth of machinery and pipe (take or leave a few thousand). It also corrals pipeliners. These are a hairy-chested, khaki-clad bunch, the type who pose for the "outdoor man" ads and smoke "real" cigarettes.

Pipeliners are a funny lot. I've seen them gently move a meadowlark's nest out of the way of an onrushing bulldozer and then snarl at each



A PIPELINER

by Lynne W. Murphy

other about moving a pipe an inch this way or that.

So they dig this long ditch along the right-of-way and they put the pipe into it. Then they throw dirt over the whole business, and the cleanup crew tries to see if it can smooth over the ground so no one can possibly find the pipe again. We take off before the oil ever starts flowing, but I understand that's the whole point of it.

Murph is very serious about his job, which I always feel is the way it should be for a man. For instance, there's a gadget called a "pig," which they use to scrape pipelines. They send it through the pipe to keep it clean. All I know is, Murph just doesn't seem to appreciate my jokes about "pigs" and pipelines.

Also, I've discovered that "dope" does not refer to the superintendent, as I originally thought, but to a mixture they spread on the pipe to prevent corrosion.

My mother is an incurable pessimist. She can't park an ordinary car in two spaces; so, naturally, she thinks the Murphys are doomed to destruction every time we put our 45-foot trailer on the road. Nor does she trust me to drive her to the grocery store, despite the fact that I drive our sedan across the country every few months. (Murph operates the truck that pulls the trailer.)

To reassure her, I write her glowing descriptions of our travels. These always begin: "Dear Mother, We are relaxing in the picturesque area of. . . ."

Anyone who knows anything at all about pipelines knows they are never laid in picturesque areas of anywhere. Nor do pipeliners "relax." The word simply isn't in their vocabulary.

I have a daydream I work on as I drive the endless miles behind the trailer. In it, the dashing owner of some of the oil wells for which we are laying pipe begs me to run away with him. He offers to take me to the Riviera, Waikiki Beach, and Acapulco.

The offers I've had from my life's companion the last few months include: 1. A glacier in Alaska ("We could hunt Kodiak bears on weekends."); 2. the desert of Saudi Arabia ("Honest, honey, it never gets hotter than 130 degrees."); 3. the Amazon jungle ("I think they cleared out all the headhunters in the pipeline area.").

I write the "picturesque" letters from a variety of places. There was one that began: "We are now in the picturesque Ozarks. Murph is lying out on the grass enjoying nature. . . ."

Actually, we were lost on an Arkansas farm road, it was pouring rain, and the temperamental trailer had just blown a tire. Murph was flat on his back trying to jack up the whole business, and the kids had been fighting over a coloring book in the back seat for the last hour. It was also Sunday morning and trailer tires are not a size that can be bought just anywhere.

Finally, we took the car and went on into Little Rock. Everything was closed up tight. We happened

Thomas J. Murphy, the pipeliner of the family, gives his spouse a lesson in the use of surveying equipment.

to see a man through the window of an auto supply store.

"Even if you do get him to open up, smartie," I said smugly, "we don't have anything but personal checks and he won't take one of those."

Murph went up and beat on the door. The guy opened it cautiously, as if he were expecting Jesse James. They talked for a while. Then I saw the checkbook come out, and my husband came back to the car rolling a tire.

"And just how did you manage that?" I inquired.

"Oh, his wife's dad is a pipeliner. I met him once on a job in Alabama—good old Butch Herkimyer."

I said a prayer for good old Butch Herkimyer.

Other "picturesque" letters have been written from: The base of a mountain that we descended without any brakes; a small northern town that was plunged into darkness because our trailer smokestack had just knocked down all the power wires; and a weighing station where we were marooned for two hours looking for Judas who was looking for a lady friend.

Judas is a big black Persian cat with a red jingle-bell collar. I don't remember the reason for the name unless it's the fact that the first of our long line of black Persians deceived me into thinking it was a tomcat and subsequently had kittens in the middle of my best bedspread. Judas rides with Murph in the cab of the purple truck. (Unless it's hot; then he rides in the car. He likes the air conditioning.)

Just this summer Murph got himself more or less of a desk job, which is what I'd always thought he'd get as a civil engineer. We even talked about buying a for-real house here in Houston. Only thing is, he had a desk job once before—for five months. I was just beginning to feel we were settled when new orders came through. A week later we were working the Louisiana swamps.

One aspect of the desk job is a special pleasure: no more lunch pail trips out to the pipeline. Murph, who is wonderful about keeping a head full of statistics, is absentminded about his sandwiches. So I used to end up on the job, knee deep in mud, and standing on one leg like a scrawny crane because my other shoe was lost in the mire. And I had to remain in this position until some pipeliner stopped long enough to retrieve it.

I remember once I was in that cranelike state when somebody growled at me: "Lady, you're standing in the way of our sideboom!"

Being as I didn't know which of the moving mechanical monsters was a sideboom, I just stood there on one foot until someone picked me up by the belt and deposited me unceremoniously in a pile of dirt.

"Tell Murph," he commented, "we're going to start charging him instead of paying him if he can't keep his wacky blonde at home!"

At that moment the superintendent, red-eyed and unshaven, dashed past—or tried to, anyhow. I stopped him to try some pleasant chitchat but was met by a scowl.

"Look, Mrs. Murphy, we have a deadline to meet. None of us has had any sleep since day before yesterday, and the rain is threatening to flood us out. Please let go of my coat."

I went home boiling mad, hauled out the typewriter and started an article entitled "Why I Hate Trailers, Traveling, and Pipeliners."

Just then a certain irresistible Irishman stuck his head in the door and favored me with the smile he usually reserves for waitresses in crowded cafes and secretaries of pipeline executives.

"I've been offered a job on a line in Montana if I can get there by Friday," he said. "But I told them 'No' because it's out in the woods, 50 miles from the nearest movie, and you would just hate it. . . ."

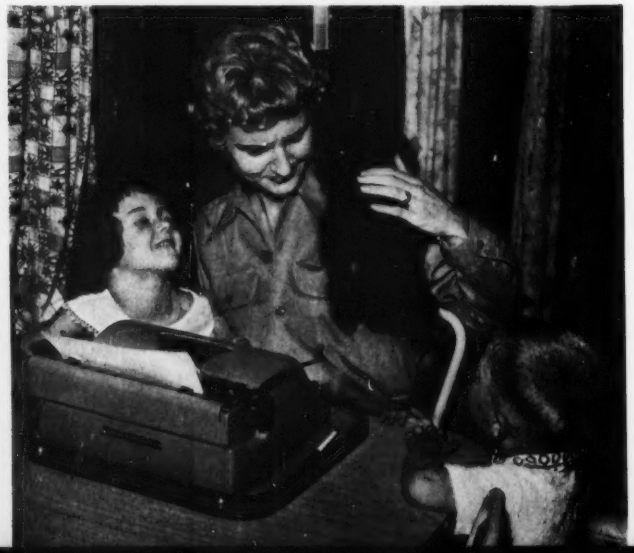
I thought just an instant about flat tires, battling a road map, my beauty shop appointment for the next day, and a whole week's wash still hanging wet on the line.

Then I started grabbing knickknacks off the bookshelf and wrapping them in newspaper.

"Run call them and tell them to hold that job open; we can be there by Thursday!" I yelled, wondering where to put the soggy wash.

"I already did!" grinned that tricky pipeliner. "Let's roll!"

Authoress Murphy and some distractions: Daughter Georgina; son Sean; and the family's pet cat, Judas.



Oil Country, U. S. A.

Green County, Kentucky

by Richard Harwood

THE Green River of Kentucky winds westward through country called The Knobs. Stunted hills rise up out of the land, suggesting the burial mounds of Indians who once hunted the dense woodlands of the region for the fox, the coon, and the possum.

It is a country that pleases the eye. But the soil is thin and rocky, the hills easily eroded. Not until the rich Bluegrass country had been filled to overflowing did Kentucky's early settlers begin to spill over into the Green River Valley and The Knobs.

During the century and a half since that time, the people of The Knobs have watched the onward rush of American progress with a skeptical and perhaps envious eye. Recurring revolutions in thought, style, and living standards have left their valley fundamentally unchanged.

Mr. Harwood, a former Nieman fellow, is a writer on economic and governmental affairs for The Louisville Times.

Sons have worked the same lands their fathers and grandfathers worked before them. They have held to the same virtues: Toil, thrift, independence, sobriety, and cash on the barrelhead, down to the penny. For life has not been easy. The small tobacco and chicken farms have average cash incomes of less than $2,000 a year. In 1956 only one farm in 20 had a telephone; half the farms were without electricity; only one child in a hundred ever got to college.

The young and the talented have been drawn away from the farms to cities outside the valley. Abraham Lincoln was such an emigrant. When he was still a child, his family gave up its homestead and sought a richer way of life in Indiana.

Greensburg, 25 miles south of Lincoln's birthplace, lies in the heart of The Knobs country. It is the seat of Green County, and it boasts the oldest courthouse west of the Allegheny Mountains. The oak trees around the building have had time to grow tall, and it is here that the old men come in good weather to whittle and doze.

In the spring of 1958 someone drove into town with news of an oil strike. He said it looked like the real thing. But the old men went on whittling. They'd heard talk of oil in Green County before.

As far back as World War I, there had been oil wells drilled in the county. A few put down in 1918 actually turned up some oil, but they produced meagerly and were abandoned in the 1920's when the price of crude oil dropped. Every few years after that someone would drill a new well, produce a few barrels, and then give it up as an unprofitable gamble.

The people of The Knobs had good reason to be skeptical about oil strikes; yet there were a few men who persisted in the hope that some day someone would find a technique of bringing up the oil at a profit. They held on to mineral leases they had bought from neighboring farmers over the years for a dollar an acre—sometimes a dollar a farm.

Late in 1955 one of these leaseholders, J. B. Thompson, got in touch with colorful old Harry Lambert of Louisville, who had been wildcatting for oil all over America for more than 60 years. Lambert drove down to Greensburg, looked over Thompson's leases, and agreed to reopen a couple of wells drilled in 1918. He brought up driblets of oil from the old holes. Then he drilled a few of his own.

At this point the veteran wildcatter ran into the problem that had long plagued Green County drillers: salt water. Whenever the limestone formations overlying the oil-bearing rocks were punctured, salt water flooded into the well.

Lambert put pumps on the wells to drain off the salt water. He maintained the operation for months on end without success. Finally, in 1958, the oil began to flow in commercial quantities. By May of that year even the courthouse skeptics became convinced that a major oil strike was in the offing. Lambert had found the technique.

Within weeks life in the Green River Valley took on a new rhythm and, it is fair to say, a new hope. Sleepy Greensburg came alive. Creaking drill rigs, ponderous bulldozers, and many-wheeled trucks rumbled into town. Oilmen came by the hundreds—from Pennsylvania,

Geologists and barbers were neighbors when Greensburg became center of oil strike.

A pump in the backyard brought a new way of life to hundreds of poor farmers.

Texas, California, Idaho, the Dakotas, and from as far away as Alaska.

Trailer camps sprang up on the approaches to town. Warehouses, pipe stockpiles, equipment yards, and storage tanks spread like crab grass along the rutted, dusty country roads.

During the next two years 2,500 wells were drilled. Production soared from 70 barrels a day at the end of 1957 to 51,000 barrels a day at the peak of production last year.

The farmers of the valley watched with mixed feelings. It seemed to most of the people that they were on the threshold of a new life. But some of them expected too much. Others feared exploitation by outsiders. And there was a reluctance to see the old patterns of life disturbed.

As the months passed, it became obvious that not every man would become wealthy. It became equally obvious that the region was experiencing the most dramatic economic lift in its long history.

Exploitation by outsiders did not occur. The lands and the leases were locally owned when the drilling started, and they have by and large remained in local hands. Refineries have paid nearly $50 million for Green River oil in the past two and a half years, and most of this money has stayed in the valley.

Hundreds of farmers and merchants have gained the stake for long-deferred capital improvements. They have put their money into new barns and farm machinery and better breeds of livestock. Land values in the county have doubled. Local government and local school districts have a far more adequate tax base than ever before.

Work has begun on a half-million-dollar hospital—the first in the history of Green County. Farm roads, for years impassable in winter, are being rebuilt. A score of new bridges has been erected. A school-building program is in the planning stage.

Virtually every farm now has electricity. The old cabins have been torn down, and modern homes have supplanted them. Farm women have begun to acquire the laborsaving devices that are commonplace in more prosperous areas: Washing machines, refrigerators, and freezers.

These are dividends of the oil strike; and if they are not spectacular, they are nonetheless tangible and significant in the lives of the people.

There have been problems too. Money was lost in unwise speculation. Some developers spaced their wells too closely and pumped them too hard—and more than 200 wells have been abandoned after less than two years. Salt water was pumped into some streams, damaging the water supply.

As a result of these early experiences, oilmen and public officials joined in the development of conservation programs that are likely to prevent a repetition of the problems encountered in Green County. Laws governing the spacing of wells have been enacted, and an oil regulatory and conservation agency has been created by the State at the urging of the oil industry. Salt water now is being pumped back into the earth where it is being used for recovery of more oil through the flooding technique.

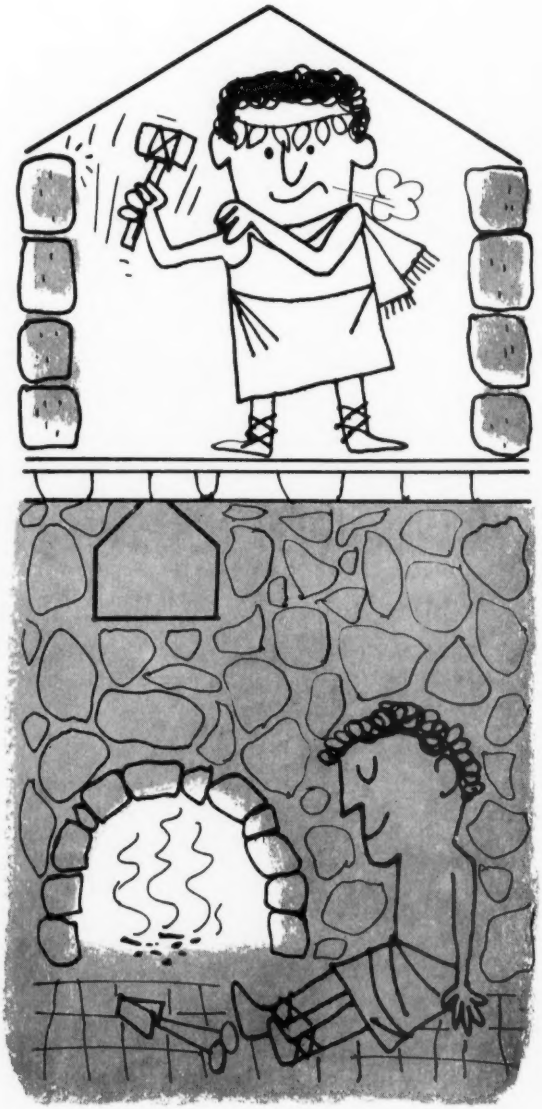
Production in the Green County field is now running about 13,000 barrels a day, and the hectic first months of the oil strike appear to have passed for good. Greensburg no longer is clogged by trucks and cars with out-of-State license plates. It is no longer necessary to stand in line for a meal or drive 50 miles for a motel room. The farmers are talking more about tobacco and beef cattle, and less about leases and drill bits.

Veteran wildcatter Harry Lambert: He just kept pumping until the oil came up.

But from the road you still see the pumps chugging in the fields and on the hillsides. The oil still pours forth with its promise of a better way of life for the valley. And the slumber of the oldtimers about the courthouse is broken by the sound of hammers and saws as Green County remodels and enlarges the old building to match its new prosperity.

HOME IS WHERE

A brief but partisan history of heating upon the occasion of a 75th anniversary



ON a hot summer's day in 1885 the citizens of Little Falls, New York, learned that a fellow townsman, one David H. Burrell, had received a patent for "a furnace to burn oleaginous matter."

They were not impressed. For that matter, neither was anyone else. Burrell's patent languished and lapsed.

The years passed. Then some months ago a student of the art of home heating (there are such) came upon a reference to the Burrell furnace. He sent for a copy of Patent No. 324,005. And there he recognized what the citizens of Little Falls had understandably failed to appreciate: the prototype of the modern oil-fired central heating plant.

Out of the student's discovery has grown a nationwide celebration, a diamond jubilee. David Burrell has been taken to the heart and hearth of the fuel-oil industry—as a symbol of the changes in America's living habits made possible by oil heat. And the history of home heating, and of petroleum as giver of warmth, is being spread across the land.

AMONG aristocratic Romans of the time of Julius Caesar, the heating system known as the hypocaust was a very special status symbol.

When the man of the villa felt a chill, he would tap the wall with a mallet. In the basement a waiting slave fed wood or charcoal to a furnace. The heat rose, warming the air below the sealed tile floor; smoke was channeled outside through an ingenious arrangement of flues.

Assuming that the slave woke up on signal, the Roman home heater was virtually perfect. But it was not destined to endure.

THE HEARTH IS

Barbarians from the north overran the empire, the Dark Ages set in, and the glorious achievements of the past were but a memory. And in the case of central heating by hypocaust, not even that.

The very concept of the hypocaust was forgotten. The man of the manor or castle or colonial estate built his fire in an open hearth and let it go at that. Ben Franklin summed up the disadvantages of the arrangement; it produced, said he, "filthy vapors" and it caused a man to be "scorched before while he is froze behind."

Eventually, iron stoves appeared, but they were inadequate. Not until Franklin designed the famous stove that bears his name was any real improvement made. His invention not only warmed the air but circulated it and at the same time gave off a minimum of the smoke he so despised. At last a room could be maintained at a uniform temperature.

Franklin's stove still fell short of the hypocaust standard; it did not provide central heating for the entire home. Not until the early 19th century did man match his achievement of the first century B.C. —with the development of the coal-burning hot-air furnace. Steam heat and hot-water heating plants followed close behind.

IT was just 101 years ago that "oleaginous matter" was first produced in commercial quantities. The man responsible was Edwin L. Drake, who brought in the first successful oil well, in Western Pennsylvania. The petroleum was primarily considered as a source of lamp fuel, not as home-heating oil.

The year 1885 looms large in our story. Citizen Burrell of Little Falls received his patent. A man in Minneapolis put together a system of thermostats and damper flappers that presaged modern automatic controls. And in the oilfields of Pennsylvania, merchants began to make use of petroleum as a heating fuel.

Barrels of petroleum were set upon stilts in backyards. The oil flowed into offices and stores by means of a quarter-inch pipe that led into stoves and warm-air furnaces. There it dripped over a brick surface and when ignited, burned with a steady and relatively smokeless flame.

The Columbian Exposition at Chicago in 1893 was one of the most spectacular world's fairs in history. It featured a "city" of million-dollar buildings, important scientific exhibits—and the provocative belly dances of "Little Egypt." Of somewhat lesser interest was the fact that the patrons of the exposition, and the sometimes scantily clad performers as well, were kept warm by 54 boilers whose burners were fueled with oil. The event provided the first dramatic large-scale demonstration of oil heat.

Another milepost in the public acceptance of fuel oil was the installation by the Army of oil burners throughout Fort Baker, California, in 1912. And when World War I brought severe rationing of coal, Americans began to buy oil burners to provide heat on "fuel-less days." Once the trend toward fuel oil had begun, it was never halted.

THE device in the basement that turns oil into heat is probably the least understood of all the accouterments of the modern home. And for good reason. It is enclosed. It operates automatically and thus requires no attention. Even the delivery of fuel is on an automatic basis.

About 80 percent of today's oil-fired furnaces have conventional high-pressure gun-type burners. These consist essentially of a nozzle, an igniter, and an electric-motor-driven pump and fan.

The pump forces heating oil, under pressure, through the nozzle. The oil is broken into a fine mist that is mixed with air supplied by the fan. The mixture is ignited by an electric spark.

Why bother with mist? Because No. 2 oil used in home heating cannot be ignited in liquid form. A lighted match dropped into No. 2 oil will be snuffed out.

Why doesn't it burn? Because modern heating oil is a far cry from crude petroleum. It is as carefully blended and refined as gasoline, with impurities removed and additives added—a chemically "constructed" product rather than a natural one. And its color, by the way, is gold or white.

The "new look" in fuel oil and furnaces has its counterpart in today's methods of fuel delivery. Key development has been a system that enables the fuel-oil dealer to know how much oil a home has used during a given period of time without even going near the place.

The secret is a formula based upon the "degree-day," a mathematical shorthand technique for translating weather into consumer need. It is a system so simple, says the industry, that any high school student can handle it. But newspapers and television stations have tried to explain it to the public for years without noticeable success.

Suffice it to say that by applying such variables as temperature, wind, sun, time of last delivery, and type of furnace, the fuel-oil man keeps the tank full. As Keats said, in a rather different connection: "—that is all/Ye know . . . and all ye need to know."

Other new delivery methods are more mundane. Dealers' trucks have two-way radios, high-speed pumps, accurate meters, and ticket printers. Fuel tanks have an attachment that whistles while delivery is being made, stops when tank is filled.

IN celebrating its past and present, the oil-heat industry is also calling attention to the future. Furnace designers have developed models that are smaller, less expensive to operate, more efficient.

One design does away with the chimney; another, with the starting switch; still another, with combustion chamber, fuel pump, and combustion head. There's even one unit that works with an invisible flame.

The ultimate in oil heat is represented by one expert's prediction that the home of the future may satisfy all its electrical, as well as heating, needs by means of a single oil-fired turbine generator.

The men of the oil-heat industry naturally find such a prospect tantalizing, but they are not limiting themselves to dreaming about it. Large-scale industry-wide research is already under way. And new programs aimed at improving oil-burner efficiency and design are being prepared—including an extensive study planned by the American Petroleum Institute.

For the past with its hypocausts and hearths may be interesting, but the latter-day Burrells of the oil-heat industry are more concerned with the future.

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